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A CHILDHOOD ATTITUDE INVENTORY FOR PROBLEM SOLVING.

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THIS PAPER DESCRIBES A 60-ITEM GROUP ADMINISTERED PAPER-PENCIL ATTITUDE INVENTORY COMPRISED OF TWO SCALES, ONE ASSESSING THE CHILD'S BELIEFS ABOUT THE NATURE OF THE PROBLEM-SOLVING PROCESS (SCALE I) AND THE OTHER ASSESSING THE CHILD'S SELF-CONFIDENCE IN UNDERTAKING PROBELM-SOLVING ACTIVITIES (SCALE II). DATA FROM 325 FIFTH-GRADE AND SIXTH-GRADE STUDENTS ARE REPORTED. TEST-RETEST RELIABILITY OVER A FIVE-WEEK INTERVAL AVERAGED .69 FOR SCALE I AND .65 FOR SCALE II. BOYS TEND TO RATE THEMSELVES SLIGHTLY HIGHER THAN DO GIRLS IN THEIR ABILITY TO DEAL SUCCESSFULLY WITH PROBLEM-SOLVING SITUATIONS, WHEREAS THERE ARE NO SEX DIFFERENCES REGARDING BELIEFS ABOUT THE NATURE OF PROBLEM SOLVING. (AUTHOR)

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A Childhood Attitude Inventory for Problem Solving[1]

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The development of the Childhood Attitude Inventory for Problem Solving (CAPS) represents part of a larger effort to devise instruments to assess problem-solving competency among upper elementary school children (Covington, 1966a; Covington, 1966b).

CAPS consists of two scales. Scale I is designed to indicate the child's beliefs about the nature of the problem-solving process and his attitudes toward certain crucial aspects of problem solving, such as the expression of novel or unusual ideas. A number of related themes are treated, including the child's conception of the inmateness or unchangeability of one's problem-solving ability, the desirability of supressing rather than expressing novel ideas, the wisdon of persisting in the face of a problem that others have failed to solve, and the value of generating many ideas. The scale consists of 30 such true-false items.

Scale II, also consisting of 30 true-false items, is intended to assess the child's feelings about his own ability to succeed in problem-solving situations. Questions concerning some of the typical sources of childhood anxiety about thinking are represented. This includes the fear of having one's ideas held up for ridicule, anxiety about not understanding how to go about solving problems, and the fear that one is not capable of effective thought.

fIn the introduction to CAPS an effort is made to give a broad view of what constitutes a problem rather than the more limiting and specific

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interpretation typically held by most school children of an arithmetic exercise. The introduction reads as follows:

> In this booklet, we want you to tell us how you feel about thinking and working on problems. There are many kinds of problems, such as the ones you have in arithmetic, but we are interested here in the kind of problem in which you have to <u>think</u>. Here is an example of the kind of problem we are talking about:
>
> Some men want to run a TV cable through a pipe that is six inches in diameter and several hundred feet long. The pipe has many twists and turns in it. The men have already tried to push the TV cable through the pipe from both ends, but the cable gets stuck in the pipe each time after only a few feet have gone in. The <u>problem</u> is to think of ways to get the cable through the pipe without cutting the pipe open.

Preceding the presentation of the items from Scale I is the statement:

> Pretend your class has been given a problem like this one to solve. Listed on the next few pages are some things children might say about thought problems like this one. We want you to circle the word "Yes" if you agree with the statement. Circle the word "No" if you disagree. These are questions about how you think and feel, so there are no right or wrong answers.

The items from Scale II are precedded by the statement,

> Now we would like to know how you, yourself, might feel when working on problems like the one of getting the TV cable through the pipe. Remember, these questions are about how you think and feel so there are no right or wrong answers.

Procedure

The development of the present form of CAPS covered a period of three years. The initial form consisted of 40 true-false items in Scale I and 25 true-false items in Scale II. To obtain information about any difficulties in administration or comprehension of the directions and to provide data for item analysis, this initial form was tried out on a total of 123 fifth-grade and 65 sixth-grade Ss from the Berkeley public schools and vicinity. Using the median score on Scale I as a cutting point, the Ss were divided into high and low scores. The same computation was done for Scale II. Point bi-serial correlations were then computed for each item between the total score on a given scale and the relative proportions in the high and low groups answering consistent with the scoring key. Items not differeing significantly from zero ($p < .05$) were either dropped entirely from the scale or substantially modified. The magnitude of the reliability coefficients for the preliminary form were encouraging, being .93 for Scale I and .86 for Scale II, using the K-R formula 20, and .71 and .69, respectively, for a Pearson product-moment test-retest reliability over a four-week interval.

The present form of CAPS was administered on two separate occasions to seven fifth-grade and five sixth-grade classrooms from the Berkeley public schools, representing a total of 325 children from the four different elementary schools. A five week period intervened between the two administrations.

Results

Means, Standard Deviations and Reliability Coefficients

Table I presents the means, standard deviations and reliability coefficients for both Scale I and Scale II broken down by grade level with sexes combined.

Insert Table 1 about here

The Pearson product-moment test-retest reliability coefficients for both the fifth-grade and sixth-grade levels taken separately are satisfactory in magnitude, indicating that the position of the subject relative to his group tended to remain reasonably constant over the five-week period.

Sex Differences

Sex differences were evaluated separately for each grade level (see Table 2).

Insert Table 2 about here

An analysis of variance was performed on each scale separately. The main effect of Grade was significant for both Scale I, $F(1, 321) = 77.17$, $p < .01$ and Scale II, $F(1,321) = 11.17$, $p < .01$, while in neither case was the Grade X Sex interaction significant ($F < 1.00$). The main effect for Sex was significant only for Scale II, $F(1,321) = 4.98$, $p < .05$. This latter outcome is consistent with other previous

findings, namely that boys tend to make higher estimates of their ability to do schoolwork than do girls (Brandt, 1958; Wylie, 1961). However, when individual contrasts were computed within each grade level.

The Relationship Between the Scales

Although the two scales measure related aspects of the student's attitudes toward problem solving, the amount of overlap was assumed to be modest, since the possession of varying degrees of self-confidence is not necessarily dependent on one's understanding of the problem-solving process. For example, a student might have an excellent appreciation and grasp of the nature of problem solving yet hold a low opinion of his own ability to cope with problems. This prediction of a positive, yet modest, correlation was borne out by the data. The Pearson product-moment correlation between the two scales for the total sample of 325 Ss was .35.

The Relationship with Other Selected Indices

Table 3 presents the product-moment correlations between scores on Scale I and Scale II and various standardized tests administered at the same time as CAPS.

Insert Table 3 about here

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Age, at least within the span of the upper elementary grades, is unrelated to scores on either scale. The age scores range from 106 months to 144 months and were essentially normal in their distribution. There are significant positive correlations between both scales and the California Test of Mental Maturity (Sullivan, Clark, & Tiegs, 1961). Both scales are negatively correlated with two anxiety indices, TASC and GASC (Sarason, Lighthall, Davidson, Waite, & Ruebush, 1960).

Discussion

CAPS holds promise as a useful tool for investigating the relationship between problem-solving attitudes and various kinds of learner characteristics. In this connection an interesting line of inquiry suggests itself from the present data. Although there exists positive correlations between both scales and intellectual ability, the three IQ measures listed in Table 3 are correlated in each case to a significantly greater degree with Scale I than with Scale II ($p < .05$). This suggests that while brighter children tend to understand the nature of problem solving better than do less bright children, these two groups may not differ substantially in their respective estimates of self-confidence. In anothe direction of research Torrance (in press) has used CAPS to identify differences in proglem-solving attitudes between average achieving junior high school students and potential dropouts.

Another fruitful line of inquiry involves exploring the relationship between expressed attitudes toward problem solving and actual problem-solving performance. In this regard it has been found elsewhere (Covington, 1966c) that while substantial positive correlations exist

between Scale I and various indices of complex problem solving, such as incident of solution, the correlations between these performance measures and Scale II are negligible. This finding holds a number of implications, among them that positive attitudes toward problem solving may be an important prerequisite for effective high-level thinking, and that a high degree of self-confidence in itself is not sufficient.

CAPS has also been used to assess changes in attitudes occurring as a function of various training programs designed to foster productive thinking, both at the upper elementary level (Covington, 1966b; Covington, Crutchfield, & Davies, 1966) and at the college level (Amrams, 1966).

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Footnotes

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Table 1

Means, Standard Deviations and Reliability Coefficients for Scale I and Scale II by Grade Level with Sexes Combined

Grade	Scale I				Scale II			
	N	Mean	SD	r	N	Mean	SD	r
5	191	14.36	5.26	.70	191	11.77	4.14	.65
6	134	19.62	5.53	.67	134	13.34	3.87	.64

Table 2

Means and Standard Deviations for Scale I and Scale II by Sex and Grade Level

Grade		N	Scale I		Scale II	
			Mean	SD	Mean	SD
5	Boys	100	14.25	5.15	12.42	3.93
	Girls	91	14.48	5.45	10.92	4.11
6	Boys	78	19.00	5.67	13.47	4.17
	Girls	56	20.48	5.27	12.93	3.84

Table 3

Correlations Between Selected Variables and Scale I and Scale II

	Scale I (n = 325)	Scale II (n = 325)
Age	-.06	.06
Total IQ, California Test of Mental Maturity (CTMM)	.35*	.18*
Language Section	.38*	.23*
Non-Language Section	.33*	.11
Test Anxiety Scale for Children (TASC)	-.23*	-.47*
General Anxiety Scale for Children (GASC)	-.16*	-.30*

*Significant beyond the .01 level.

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Abstract

This paper describes a 60-item group administered paper-pencil attitude inventory comprised of two scales, one assessing the child's beliefs about the nature of the problem-solving process (Scale I) and the other assessing the child's self-confidence in undertaking problem-solving activities (Scale II). Data from 325 fifth-grade and sixth-grade students are reported. Test-retest reliability over a five-week interval averaged .69 for Scale I and .65 for Scale II. Boys tend to rate themselves slightly higher than do girls in their ability to deal successfully with problem-solving situations, whereas there are no sex differences regarding beliefs about the nature of problem solving.